LETTER TO THE EDITOR

Nr 2024;14 (4):623-624

Ref: Ferreira Pedrosa *et al. More Training, Less Trainability: True? A muscle Swelling Analysis* (doi: 10.32098/mltj.03.2024.03)

Vinnycius Nunes de Oliveira

Faculty of Physical Education and Dance, Federal University of Goiás, Goiânia, Brazil

CORRESPONDING AUTHOR:
Vinnycius Nunes de Oliveira
Faculty of Physical Education and Dance
Federal University of Goiás
Av. Esperança s/n, Chácaras de Recreio Samambaia
Goiânia 74690-900, Brazil
E-mail: vinnyciusnunes@discente.ufg.br

DOI:
10.32098/mltj.04.2024.12

LEVEL OF EVIDENCE: 7

KEY WORDS
Statistical methods; muscle swelling; resistance training; statistical analyses; trainability.

To the Editor,

I read with great interest the article done by Pedrosa and colleagues (1), who conducted an experiment to compare muscle swelling among groups of individuals with different levels of experience in resistance training. First, I would like to compliment the authors on the relevancy of the study. However, in this letter, I would like to highlight major concerns regarding the statistical analysis on which the conclusions of the article were based.

According to the article, the objective of the study was to compare muscle swelling between two groups: 1) more experienced, and 2) less experienced. The authors conclude that "the results suggest that individuals with more training experience should train with a higher training load than less experienced individuals to induce an equivalent level of muscular swelling." In other words, they claim a difference in outcomes between the groups. However, these conclusions are influenced by methodological issues, and statistical analysis does not support such conclusions. In this latter, I will highlight issues that may have been overlooked throughout the peer-review process.

To compare the outcomes, the authors transformed observed values into relative values as an indicator of muscle swelling ((pos-pre) / pre) × 100) and utilized a paired t-test. Nevertheless, percent change is not the best analysis method, as it can lead to several issues that affect reliability and interpretation of results, especially when comparing groups and changes over time. The use of percentage change from baseline as an outcome is statistically inefficient, as show a simulation study (2). The main reasons are: 1) this analysis is sensitive to baseline values of the participants. If a group has a low baseline value, even small changes can result disproportionately. This can distort the effect and comparison between groups, for example: group A has pre = 10 and post = 20 (percentage change = 100%), while group B has pre = 100 and post = 110 (percentage change = 10%); 2) another concern is that using relative percentages obscures the actual magnitude of the change, due to percent change focuses on proportionality rather than the actual amount of change. Understanding the absolute change provides a clearer picture of the real-world impact; 3) percentage changes are not symmetric, for example, group A starts with 50 and increases by 50%, so the new value is 75, group B

starts with 200 and decreases by 50%, so the new value is 100, although both groups experience a 50% change, the final outcomes are very different because the percentage change is calculated based on the initial values, this makes it difficult to directly compare the change between the two groups; 4) better alternatives exist that directly compare the absolute pre- and post-values between groups, such as a repeated measures analysis of variance or a linear mixed model. These methods consider measures within and between groups while adjusting for baseline difference, leading to a more accurate analysis of the effect (3, 4); and 5) according to the statistical analysis section of the article, the paired t-test was utilized for all comparisons, this choice was unsuitable given the purpose of the study (5-7).

Therefore, valid conclusions on comparison among these groups should be based on the comparison of the groups performed with observed values (such as Analysis of Variance) rather than on percentage changes. The inaccurate interpretation of the authors on outcomes with base in the analysis presented can be highly misleading that are unreliable at best. Thus, these finding should be considered with great caution until a scientifically valid correction of their manuscript is provided.

FUNDINGS

None.

CONTRIBUTIONS

VNO contributed entirely to this work.

DATA AVAILABILITY

N/A.

CONFLICT OF INTERESTS

The author declares that he has no conflict of interests.

REFERENCES

1. Ferreira Pedrosa G, Laporta L, Rigo MEC, et al. More Training, Less Trainability: True? A muscle Swelling Analysis. Muscles Ligaments Tendons J. 2024;14(3):402-9. doi: 10.32098/mltj.03.2024.03.
2. Vickers AJ. The use of percentage change from baseline as an outcome in a controlled trial is statistically inefficient: a simulation study. BMC Med Res Methodol. 2001;1(1):6. doi: 10.1186/1471-2288-1-6.
3. van Breukelen GJP. ANCOVA Versus CHANGE From Baseline in Nonrandomized Studies: The Difference. Multivariate Behav Res. 2013;48(6):895-922. doi: 10.1080/00273171.2013.831743
4. de Melo MB, Daldegan-Bueno D, Menezes Oliveira MG, de Souza AL. Beyond ANOVA and MANOVA for repeated measures: Advantages of generalized estimated equations and generalized linear mixed models and its use in neuroscience research. European Journal of Neuroscience. 2022 Dec 14;56(12):608998. doi: 10.1111/ejn.15858.
5. Rosner B. Fundamentals of Biostatistics. 7th ed. Cambridge; 2011.
6. Cohen J. Statistical Power Analysis for the Behavioral Sciences Second Edition. Routledge; 1988.
7. Cohen J. A power primer. Psychol Bull. 1992;112(1):155-9. doi: 10.1037//0033-2909.112.1.155.